

JC13 Rec'd PCT/PTO 22 APR 2005

"A WHEEL AND A WHEEL DISC"

The present invention relates to a wheel, preferably a stamped wheel, comprising a wheel disc provided with multiple bores for enabling it to be fixed to wheel hubs of various vehicle models, as well as to a wheel disc
5 configured in this way.

Description of the Prior Art

The present market of vehicles is more and more competitive, which have been causing merges between large assembly plants for the purpose of ensuring greater competitiveness and greater capacity of standing
10 the pressures of the market. As a result, these novel conglomerates will try to minimize, as far as possible, their costs and to increase the productivity. With regard to the wheels, there is an increase in the trend to use wheels of the same supplier and of the same model for several lines of vehicles.

In the specific case of the wheels, there is an aggravating factor,
15 namely the fact that the vehicles of each assembly plant have different projects. As already known, a wheel is formed by a rim and a disc, the disc being provided with a central portion having at least three through bores for fixing the wheel to a wheel hub and, as a rule, a central bore. This bores are made concentrically around the central bore, but the diameter (of the circum-
20 ference) formed from the respective central points of said bores varies from assembly plant to assembly plant.

Let us take as an example of this trend the case of the companies FIAT and General Motors (GM), which have recently associated, wherein the diameter (of the circumference) formed from the central point of
25 said through-bores for fixing the vehicle disc from FIAT is of 98 mm, the boring comprising 4 bores in this case, while the vehicles from GM use wheels having 4 bores and a diameter of 100 mm.

However, there are models of these vehicles and from other assembly companies that use various other configurations of boring, which pre-
30 sent other diameter values, as well as a larger or smaller number of fixation bores.

In order to solve this problem, one has developed wheels that

comprise a disc provided with a central portion having various configurations of boring, with varying diameters and number of bores. But these proposed solutions also comprise an adapter positioned so as to overlap the central portion of the wheel disc, for positioning and fixing the wheel to the vehicle hub, according to project determinations. This type of wheel is disclosed in US Pat. 3,166,357.

However, the wheel in question, which is stamped, has a smaller thickness at the central region of the disc, which enables it to be easily stamped, but decrease the resistance of the wheel fixed to the vehicle, since the through-bores are very close to each other. When the wheel is fixed to the vehicle hub, it is subjected to a very great tightening pressure and may be damages at that (those) point(s) where pressure has been applied, due to its thinness. In this particular case, the problem has been solved by means of an adapter that is thicker and cooperates with the thickness existing on the wheel disc, thus increasing the final thickness of the assembly and distributing the load resulting from the tightening of the screws throughout its extent.

Brazilian documents PI 9204344-5 and PI 9300987-9, in turn, discloses light alloys cast wheels, which have the same concept of the wheel presented by the above mentioned US Pat. 3,166,357. The bores existing in the central portion of the wheel disc are extend radially, and this portion receives, in an overlapped manner, an adapter disc provided with a variety of different bores that are compatible with a determined number of automobiles.

The three documents cited above use adapters that increase the final cost of the wheel and makes it difficult to fix the wheel to the vehicle hub.

Brazilian Document PI 9203685-6 discloses a wheel made of a light alloy, which comprises a disc provided with a central portion having eight bores, which form two sets of four bores each. Each set comprise four bores arranged concentrically to the central bore of the wheel disc, thus forming a circumference of a particular diameter. In this way, one makes bores having circumferences of different diameters. However, the wheels of light alloy are of completely different manufacture and much more expensive and,

therefore, they do not originally equip economical and utility vehicles, which limits their penetration into the market and, consequently, their sale potential.

For this reason, they are hardly accessible to a public that is not wealthy, since this type of wheel may be five times as expensive as the stamped-steel wheel.

The wheels of light alloy are more expensive for various reasons, namely:

- the need for a material that has a higher final cost, as for example aluminum, the machining of which consumes much electric energy;

- in order to be casted, the wheel of light alloy needs more manufacture material than steel wheels, so that more strength can be provided for its utilization.

All these additional costs end up being passed on to the final consumer, which greatly raises the cost of this type of wheel.

The wheel of light alloy are made of technically fragile material, that is, they stand a determined strain, after which they merely break, presenting little deformation, while the wheels of steel deform and, consequently, may prevent an accident, since by collapsing they prevent an immediate leakage of air out of the tire, thus enabling a less skillful driver to control the vehicle. In the case of the wheels of light alloy, on the contrary, the bursting is immediate.

For the user of the stamped steel wheels from the prior art there is another drawback. When the consumer changes the vehicle and intends to continue with them for a future change of vehicle, he often can not make use of them on the new vehicle. This occurs since, when the mark and/or model of the new vehicle is different, the bore diameter of the wheel disc for fixing it to the hub is different from that of the preceding. Therefore, in these cases the consumer can not continue to use the same wheels.

Objects of the Invention

An object of the present invention is to provide a wheel that is preferably stamped from steel, comprising a wheel rim and a wheel disc associated to each other. The disc is provided with a central portion that has a

central bore and at least two sets of fixing bores, which are concentric thereto. Another objective of the invention is to provide a wheel disc thus configured.

Brief Description of the Invention

5 The objects of the present invention are achieved by means of a wheel, particularly for use on vehicles, comprising a wheel rim and a wheel disc associable to each other, the disc being provided with a central portion which comprises a region for accommodating the wheel hub of the vehicle, around which at least six fixing bores are arranged, wherein:

- 10 - the fixing bores configure at least one first set defining a first circumference that has a first diameter, and a second set defining a second circumference that has a second diameter different from the first diameter;
- the wheel is associated to the wheel hub of the vehicle by direct association of at least three fixing elements with the first or the second set
- 15 through the respective fixing bores.

 Also, the objectives of the present invention are achieved by means of a wheel disc, particularly associable to a wheel rim, forming a wheel for use on vehicles, provided with a central portion that comprises a region for accommodating the wheel of the vehicle, around which at least six

20 fixing bores are arranged, wherein:

- the fixing bores configure at least one first set defining a first circumference that has a first diameter, and a second set defining a second circumference that has a second diameter different from the first one;
- the disc is directly associable to the wheel hub of the vehicle by
- 25 direct association of at least three fixing elements with the first and second set through the respective fixing bores.

 The present invention has the following advantages, among others:

 1) decrease of the areas of the assembly cells, since the different

30 types of wheels to be assembled drastically decrease, thus increasing in the useful space of the assembling plant;

 2) ease of logistic, due to the decrease in the variety of wheels

produced;

3) reduction of the wheel-manufacture cost, due to the scale economy.

Brief Description of the Drawing

5 The present invention will now be described in greater detail with reference to the embodiments presented in the drawings. The figures show:

- Figure 1: a detail view of the central portion of the wheel disc of a first embodiment of a stamped wheel from the prior art;
- Figure 2: a schematic detail view of the central portion of the wheel disc of the first embodiment of a stamped wheel from the prior art;
- Figure 3: a detail view of the central portion of the wheel disc of a second embodiment of a stamped wheel from the prior art;
- Figure 4: a schematic detail view of the central portion of the wheel disc of a second embodiment of a wheel from the prior art;
- 15 - Figure 5: a front view of a first embodiment of the wheel according to the present invention;
- Figure 6: a schematic view of the central portion of the wheel disc of the first embodiment of the wheel according to the present invention;
- Figure 7: a detail view of the central portion of the wheel disc of a second embodiment of the wheel according to the present invention; and
- 20 - Figure 8: a detail view of the central portion of the wheel disc of a third embodiment of the wheel according to the present invention.

Detailed Description of the Figures

As can be seen in figures 1 to 4, the stamped wheels from the prior art are configured for specifically meeting the projects of vehicles of each assembly plant and, therefore, they have a central bore 1' of the wheel disc 3', which has a diameter 2a' or 2b' (which will be explained in greater detail below), according to the type of vehicle on which they will be used.

Each set of bores comprises at least three fixing through-bores, which may vary from four, five, six to ten bores, and the set of bores of each assembly plant may present different diameters.

According to a preferred embodiment, the present invention

comprises a wheel 10, preferably stamped from steel, which comprises a substantially cylindrical wheel rim 11 and a substantially circular wheel disc 3. The wheel disc and the wheel rim are associated to each other, preferably by welding, but any other means may be used.

5 The wheel disc 3 comprises a substantially circular central portion 1, which defines a region for accommodating a wheel hub. Preferably, the accommodating region configures a central bore 1a, which may be a projection facing outwards and defining a cavity for accommodating the tip of an axle or else any other configuration. Around the accommodating region, at
10 least six fixing through-bores 2, 2', are concentrically arranged. Also preferably, the bores 2, 2' are located in the central portion, but there may be wheels on which these bores are located more outwardly, closer to the wheel rim 11, but always concentrically. It should be noted that the fixing bores 2, 2' are preferably formed during the process of stamping the wheel, but they may be
15 made by any other manufacturing processes.

 The bores 2, 2' are arranged around the central bore 1a, or an equivalent one, configuring at least a first and a second sets of bores that define two imaginary circumferences with different diameters 2a, 2b concentric therewith. Preferably each set of bores is formed by four different bores 2,
20 2' having first and second diameters 2a, 2b, preferably of 100 mm and 98 mm, respectively. Evidently the sets of bores may vary in the number of bores they have, depending upon the amount of fixing means existing on the wheel hub, as for example, fixing screws or studs, which will fix the wheel to the hub through these bores 2, 2'.

25 As already mentioned, each set of bores has a diameter 2a or 2b that is different from the diameter of the other set of bores, so that the wheel disclosed herein can be used on vehicles having a wheel hub with respective diameter values.

 Thus, if the user buys a set of wheels 10 according to the present
30 invention for his car, but intends to change it within a given period of time and wishes to keep the wheels, since they have two sets of bores with different diameters 2a, 2b, he may therefore use them on the new vehicle, in case

there is compatibility with regard to the number of bores 2, 2' and diameters 2a, 2b.

Following the same concept, a second and a third preferred embodiments of the present invention are foreseen, as can be seen in figures 7 and 8, respectively. In these embodiments of the wheel 10, the bores of one set are open and the bores of the other set are closed with covers 5, which may preferably be removed if they are used on another vehicle. This embodiment of the present wheel 10 equips vehicles as an original component from factory. The covers 5 also help the user to remove/replace the wheel 10 onto the vehicle during the maintenance service, since the four bores that he will use remain uncovered, and four other bores remain hidden, thus preventing the wheel from being wrongly fixed or preventing confusion. Further, if the user decides to use the wheel 10 on a vehicle compatible with the set of bores stamped in it, he may reposition the covers 5 adequately.

The covers 5 are preferably secured by pressure, but they may be fixed onto the wheel 10 by any other means.

In the exemplification of the GM/FIAT group, the solution for different sets of bores between the vehicles from the two assembly plants would be achieved, since the FIAT cars have a 98 mm (milimeters) diameter configuration of the bores around the central portion 1 of the wheel disc 3, and those from GM have a 100 mm (milimeters) configuration, defined by the respective factory projects. The group may purchase a single model of wheel 10 and equip the vehicles indistinctly with the wheel provided with two bore configuration, and also provide a vehicle with wheels having, for instance, the set of bores of the FIAT vehicle, and the hidden set of bores for use on GM vehicles, thus bringing about the sought-after scale economy.

Determined wheel hubs might present a guiding pin for optimizing the work of positioning the wheel in place, which fits into a bore 9 existing in the adequate or compatible wheels from the prior art. In the case of the wheel of the present invention, the guiding pin would be accommodated in one of the bores 2, 2' of the other set of bores existing in the wheel.

As already mentioned, for the large conglomerates that have

various marks in their production lines, the wheels 10 described herein are advantageous, since it is possible to provide them with different bore diameters 2a, 2b, with two or more sets of bores, but concordant with the marks of the conglomerate, bringing about economy, rapidity in production and reduction of the processes of manufacturing the various models of wheel, as well as reduction of stock.

Another advantage for these conglomerates is the optimization of assembly cells, which comprise a small assembly line within a general vehicle-production line. In the case of the wheels, the vehicle assembly company make available to the supplier a space within the factory. In this way, the wheel supplier associated with the tire supplier and, in a joint process, makes available the wheel-tire assembly, already assembled, balanced and calibrated, ready for mounting onto the vehicle, thus getting rid the assembly vehicle company of further concerns.

The wheel 10 of the present invention brings the following advantages for the vehicle assembly company and for the supplying company, among numberless others:

- reduction of the area of the assembly cells, since the different types of wheel that will be assembled drastically decrease, entailing an increase in the useful space of the assembly plant;
- the assembly plant does not have to worry about the mistakes of delivery, or with the type of wheel received, since the wheel may be used on various models of vehicle;
- optimization of the work at the head office of the wheel supplier, which can maintain only one shipment of wheels 10 for various assembly plants, without having to worry about separating various types of wheel, thus saving transport for the various models that would have to be delivered;
- as already mentioned, the reduction or the occurrence of mistake in the delivery, due to the fact of only one type of wheel 10, whereby one will be concerned only with the number of orders from each assembly plant;
- reduction of the cost of manufacturing the wheel 10, by virtue of the scale economy.

In order to fix the wheel 10 of the present invention onto the wheel hub of the vehicle, it is enough to position it with the set of bores adequate for the vehicle involved and to tighten the screws or other fixing elements. There is no need for using any type of adapter or any other additional
5 element, the procedure being identical to that used in the case of the conventional wheel. This means that the fixing elements associate the wheel directly with the hub without the need for adapters or other elements.

A preferred embodiment of the invention having been described,
one should understand that the scope of the present invention embraces
10 other possible variations, being limited only by the contents of the accompanying claims, which include the possible equivalents.